Catalogue of American Amphibians and Reptiles.

MECHAM, JOHN S. 1967. *Notophthalmus viridescens.*

Notophthalmus viridescens (Rafinesque) Newt

Triturus (Diemictylus) viridescens Rafinesque, 1820:5. Type-locality, "in Lake George, Lake Champlain, the springs and brooks of the neighborhood." No type designated and collector not given. *Diemictylus* proposed as a subgenus.
Notopthalmus viridescens: Baird, 1850:284.
Diemyctylus viridescens: Hallowell, 1856:11.
Notophthalma viridescens: Gray, 1858:138.
Triton viridescens: Strauch, 1870:50.
Molge viridescens: Boulenger, 1882:21.
Notophthalmus viridescens: Gill, 1907:256.
Diemictylus viridescens: Gill, 1907:256. Given as a synonym of *Notophthalmus viridescens.*
Diemyctylus viridescens viridescens: Cope, 1889:207. *N. viridescens* reduced to the nominal subspecies with the inclusion of *N. meridionalis* in the same species.
Triturus (Notophthalmus) miniatus Rafinesque, 1820:5. Type-locality, "states of New York, New Jersey, Connecticut, Vermont, etc."; restricted to "borders of Lake Champlain" by Schmidt, 1953:24. Type not designated and collector not given. Description based on eft stage. *Notophthalmus* proposed as a subgenus. [*Notophthalmus* selected in preference to *Diemictylus*, and *viridescens* in preference to *miniatus* under rule of first revisor (International Commission . . . , 1962).]

• CONTENT. Four subspecies are recognized: *Notophthalmus v. viridescens, N. v. dorsalis, N. v. louisianensis,* and *N. v. piaropicola.*

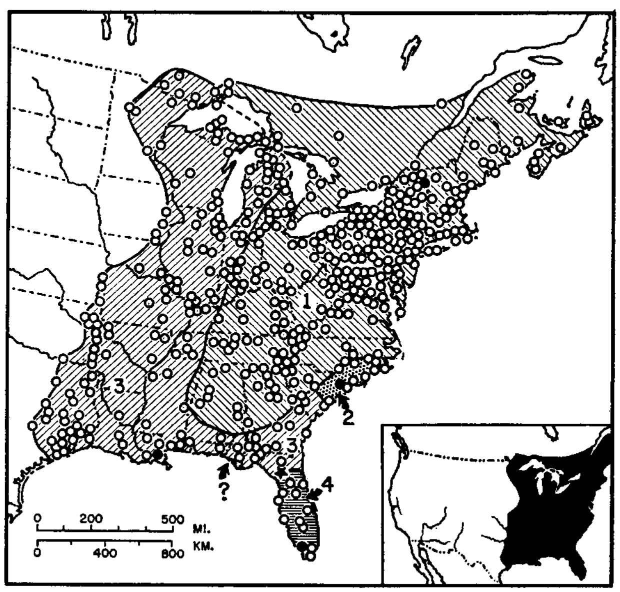
• DEFINITION. Aquatic adults (for definition of newt and eft stages see Conant 1958:213) have a total length of 65–112 mm, and a snout-vent length of 31–51 mm. Cranial ridges are slightly to prominently developed, and sides of the head are nearly parallel behind the eyes. The head width is 71–75 percent of the head length. The eye is of moderate size, its long diameter distinctly less than the distance from the anterior angle of the eye to the nostril. Vomero-palatine teeth usually originate slightly behind or opposite the level of the posterior margin of the internal nares. Hedonic pits are 3-3 in males, 0-0 to 3-3 in females. Skin of the adult is smooth to finely granular; skin of the eft is granular to spinose. Adults are yellow below and yellowish brown or olive green to dark brown above, with many small and irregular black spots scattered over venter and dorsum. Black spots on sides of the tail are larger and more diffuse in breeding males. The eft is orange red to reddish brown above, lighter below, and has some elements of the adult dorsal pattern. The eft stage is typically present, although rare in some areas. Neoteny is frequent on the southeastern coastal plain, but rare elsewhere.

• DESCRIPTIONS. Bishop (1943) provides comprehensive descriptions of the subspecies *viridescens, dorsalis,* and *louisianensis,* including information on the eft and larval stages. Conant (1958) furnishes brief descriptions of all subspecies, and Carr & Goin (1959) give precise descriptions of the adult of the subspecies *viridescens, louisianensis,* and *piaropicola.* Of the many descriptions of *N. v. viridescens,* the most complete is by Bishop (1941a), who provides detailed information on the egg, larva, eft, and adult. A detailed description of the larva, as well as information on other stages, is also given by Pope (1924). Wolterstorff's original (1914) description of *N. v. louisianensis* is detailed, and was based on a number of living specimens. Breckenridge (1944) describes adult, eft, and larval stages of this subspecies from Minnesota, and Smith (1961) the eft and adult from Illinois. The newly hatched larva of *N. v. louisianensis* is described by Goin (1951). The most complete description of *N. v. piaropicola* is the original one by Schwartz & Duellman (1952). Supplemental information is furnished by Peterson (1952) and Duellman & Schwartz (1958).

• ILLUSTRATIONS. Bishop (1943) provides photographs of the subspecies *viridescens* (adults, efts), *dorsalis* (adult female), and *louisianensis* (adult male). Colored illustrations of all subspecies and the eft and transforming eft of *N. v. viridescens* are given by Conant (1958). Cope (1889) includes diagrams of the head, mouthparts, and feet of the adult (as *Diemyctylus v. viridescens*) and eft (as *D. m. miniatus*). The spermatophore is illustrated by Jordan (1893). The most complete set of illustrations of *N. v. viridescens* is provided by Bishop (1941a). Included are photographs of adults, the eft, mature larva, and drawings of the adult male (two views), spermatophore, egg, newly hatched larva, advanced larva (two stages), newly transformed young, neotenic adult, female in oviposition, and two courtship positions. Pope (1924) gives photographs of both sexes, eggs, and advanced larvae; Gage (1891) has a colored plate with drawings of eggs, dorsal and ventral views of adults, the eft, newly transformed young, and advanced larva. Wolterstorff (1914) and Smith (1956) have photographs of the adult, and Smith (1961) of the eft of *N. v. louisianensis.* Goin (1951) has a drawing of the newly hatched larva of this subspecies. Hughes (1962) provides photographs of the embryo and early larva of *N. v. louisianensis, N. v. viridescens,* and the hybrid between these two forms. Schwartz & Duellman (1952) have drawings and Peterson (1952) a photograph of *N. v. piaropicola* showing variation in ventral pigmentation.

• DISTRIBUTION. The species is found in southern Canada, including the Maritime Provinces and southern Quebec and southern Ontario, and the eastern United States west to north-central Minnesota, eastern Iowa, extreme eastern Kansas, eastern Oklahoma, and south-central Texas. *Notophthalmus v. viridescens* occupies the Canadian portion of the range (except in western Ontario), and the eastern United States west to central Michigan (lower peninsula), central Indiana, Kentucky and Tennessee east of the Mississippi Embayment, and exclusive of the southeastern coastal plain. *N. v. louisianensis* is distributed over the coastal plain from southeastern South Carolina to south-central Texas, and extends north to Canada west of the range of *N. v. viridescens.* The range of *N. v. louisianensis* is now discontinuous in Illinois (Smith, 1961) and perhaps elsewhere in the middle Mississippi Valley because of habitat desiccation. The presence of *N. v. viridescens* on the coastal plain in western Florida, sympatric with *N. v. louisianensis,* requires confirmation. The range of *N. v. dorsalis* includes the coastal plain from Harnett and Craven counties, North Carolina, south to southern Georgetown County, South Carolina. *N. v. piaropicola* occupies peninsular Florida south of central Alachua County.

Adults and larvae occur in ponds and pools, particularly those with abundant submerged vegetation, and in swamps and quiet pools of small streams. Adults occasionally are



MAP. The solid symbols mark type-localities. Open circles indicate other selected localities. The star indicates a fossil locality. The questioned area in western Florida is the area where *viridescens* and *louisianensis* are said to co-exist (see Comment).

found under cover near dried ponds or swamps. Logier (1952) states that in some northern localities adults may hibernate on land. Adults and larvae of *N. v. louisianensis* and *N. v. piaropicola* may be abundant in beds of water hyacinth. The terrestrial efts are most common in mesic wooded areas. In northern Florida they occur in mesophytic hammocks (Carr, 1940).

• FOSSIL RECORD. Holman (1962) records this species from the Pleistocene (Kansan?) of Alachua County, Florida.

• PERTINENT LITERATURE. The most recent comprehensive taxonomic account is by Bishop (1943), and includes descriptions of all subspecies except *N. v. piaropicola.* Although emphasis is on characters, some information on habitat and breeding is included. Schwartz & Duellman (1952) and Duellman & Schwartz (1958) give some information on the ecology of *N. v. piaropicola.* The most comprehensive account of reproduction and ecology of *N. v. viridescens* is by Pope (1924, 1928); detailed information is also given by Bishop (1941a). Other useful sources for the species include Noble (1926, 1929, life cycle and neoteny on Long Island), Brandon & Bremer (1966, neoteny in Illinois), Humphries (1955, mating behavior), Jordan (1891, mating behavior, spermatophore), Jordan (1893, reproductive biology, embryonic development), Gage (1891, life history), Rogoff (1927, structure and function of hedonic glands), Adams (1940, reproductive cycle, including gametogenesis), Ifft (1942, environmental factors and the sperm cycle), Hutchison (1961, critical thermal maxima), Adams & Rae (1929, fat bodies), Wahlert (1953, oviduct, cloaca), and Logier & Toner (1955, Canadian distribution). Humphrey (1925) and Obreschlcove (1924) discuss the multiple testis; Grant (1961) reviews studies on the water drive and the endocrinology of changes associated with the first and second metamorphosis. Neill (1952) and Christman (1959) remark on sound production. Morgan & Grierson (1932), Wood & Goodwin (1954), and Hamilton (1932, 1940) give information on food and feeding; Reese (1912) and Copeland (1912) discuss olfactory reactions. See also Lipsett & Piatt (1936, experimental hybridization between the subspecies *viridescens* and *symmetrica* [= *dorsalis*?]), Hughes (1962, experimental hybridization between the subspecies *viridescens* and *louisianensis,* and heteroploidy), Lehman & Youngs (1958, experimental hybridization of *N. viridescens* with *Taricha granulosa*), Fankhauser (1938, 1941, chromosome number, natural triploidy), Fankhauser & Watson (1942, heat-induced triploidy), Fankhauser & Griffiths (1939, cold-induced triploidy, haploidy), Kaylor (1937, 1941, androgenesis), and Fankhauser (1963, use as a laboratory animal).

• ETYMOLOGY. The name *viridescens* (Latin, *viridis,* "green") refers to the greenish color often found in this species; *dorsalis* (directly from Latin, "pertaining to the back") presumably alludes to the broken red lines on the dorsum; *louisianensis* refers to the state in which the type-locality is located; *piaropicola* (Greek, *piaros,* "fat" or "thick") alludes to propensity of the newts to inhabit beds of water hyacinths (*Piaropus*).

1. *Notophthalmus viridescens viridescens* (Rafinesque) Red-spotted newt (aquatic adult), red eft (juvenile land stage)

Triturus viridescens Rafinesque. See species account.
Diemyctylus viridescens viridescens: Wolterstorff, 1914:1.
Diemictylus viridescens viridescens: Wolterstorff, 1925:292.
Notophthalmus viridescens viridescens: Stejneger & Barbour, 1917:8.
Triturus viridescens viridescens: Stejneger & Barbour, 1923:4.
Triturus miniatus Rafinesque. See species account.
Notophthalmus miniatus: Kennicott, 1855:593.
Diemyctylus miniatus: Hallowell, 1856:11. Given as a synonym of *D. viridescens.*
Notophthalma miniata: Gray, 1858:138.
Diemyctylus miniatus miniatus: Yarrow, 1882:161. Trinomen used for the eft stage.
Diemyctylus miniatus viridescens: Yarrow, 1882:161. Trinomen used for the adult.
Diemyctylus viridescens miniatus: Hay, 1887:6.
Salamandra symmetrica Harlan, 1825:157. Type-locality, "South Carolina." Acad. Nat. Sci. Philadelphia 1582 and 1584 identified as probable "cotypes" by Bishop, 1941b:2. Collected by Dr. Blanding, possibly near Camden.
Triton symmetricus: Duméril & Bibron, 1841:154.
Salamandra greeni Gray, 1831:107. Replacement name for *viridescens;* see Boulenger, 1882:22.
Salamandra millepunctata Storer, 1840:60. Type-locality, "Roxbury and Amherst," Massachusetts. No type designated. Specimens collected by Drs. Adams and Brewer.
Triton millepunctatus: DeKay, 1842:84.
Triton punctatissimus Duméril & Bibron, 1841:154. A replacement name for *millepunctata.*
Salamandra coccinea DeKay, 1842:81. Type-locality, "Lake Pleasant, Hamilton Co.," New York. No type designated. Collected by J. E. DeKay. Description based on eft stage.
Salamandra ventralis Provancher, 1875:251. Type-locality, "le lac sur la montagne d'Yamaska," Quebec. No type designated, and collector not given.

• DEFINITION. Aquatic adults have a total length of 72–112 mm, and a snout-vent length of 33–51 mm. Skin of the adult is smooth to finely granular. Hedonic pits are 3-3 in both sexes. Adults are yellow below, olive green or yellowish brown to dark greenish brown above. Numerous small black spots are found on both venter and dorsum, the dark spots of the dorsum sometimes coalescing to form a mottled pattern. A series of orange red to red, black-bordered spots, variable in number and size, is present on either side of the middorsal line; a second irregular series of red spots is rarely present on the lower side. Efts are orange red to dull red above, yellow orange below, with black-bordered red spots as in the adult. Larvae are pale gray, green, or brown tinged with yellow. Dark chromatophores are scattered over the sides and dorsum, and aggregate to form scattered spots on the dorsal ridge, gills, and legs. A conspicuous dark bar extends through the eye to the nostril. The terrestrial eft is common throughout most of the range, whereas neoteny is rare.

2. *Notophthalmus viridescens dorsalis* (Harlan) Broken-striped newt

Salamandra dorsalis Harlan, 1828:101. Type-locality, "South Carolina," restricted to "northeastern South Carolina" by Schmidt (1953:24). Acad. Nat. Sci. Philadelphia 1583 and 1585–86 identified as probable "cotypes" by Bishop (1941:2). Collected by Richard Harlan.
Triton dorsalis: Duméril & Bibron, 1851:155.
Triturus dorsalis: Dunn, 1918:452.
Triturus viridescens dorsalis: Stejneger and Barbour, 1923:4.
Diemictylus viridescens dorsalis: Wolterstorff, 1925:293.
Notophthalmus viridescens dorsalis: Smith, 1953:98.
Diemyctylus viridescens vittatus Garman, 1896:49. Type-locality, "Wilmington, North Carolina." Cotypes, U. S. Nat. Mus. 23797–9, collected by H. Garman, 22 July, 1892.
Notophthalmus viridescens vittatus: Stejneger & Barbour, 1917:8.
Triturus viridescens symmetrica: Stejneger and Barbour, 1933:4. A misapplication of the name *symmetrica.* As pointed out by Bishop, 1941b, p. 2, the original description of *Salamandra symmetrica* Harlan clearly pertains to *N. v. viridescens.*
Notophthalmus viridescens symmetrica: Herre, 1936:196.

• DEFINITION. Aquatic adults have a total length of 65–94 mm, and a snout-vent length of 32–46 mm. Skin of the adult is smooth to very finely granular. Hedonic pits are 3-3 in males, 0-0 to 3-3 in females. Adults are yellow below, olive green above, with the dark dorsum sharply demarcated from the light venter. Small black dots are numerous on the venter, become more sparse on the sides, and are sometimes absent from the dorsum. A broken red stripe completely edged with black extends from the back of the head to the base of the tail on either side of the middorsal line; an irregular row of black-bordered red spots on the lower side of the body and an indistinct light middorsal stripe may also be present. The eft is reddish brown with red dorsal stripes incompletely bordered by black. Advanced larvae have indistinct dorsolateral red stripes unbordered by black and the belly faintly speckled with black. Efts are common. Neoteny is unrecorded.

3. *Notophthalmus viridescens louisianensis* (Wolterstorff) Central newt

Diemyctylus viridescens louisianensis Wolterstorff, 1914:383. Type-locality, "New Orleans, Louisiana." No type des-

ignated, and collector and date of collection not given. Description based on both sexes.

Diemictylus viridescens louisianensis: Wolterstorff, 1925:293.

Triturus viridescens louisianensis: Schmidt and Necker, 1935: 62.

Notophthalmus viridescens louisianensis: Herre, 1936:196.

Triturus louisianensis: Carr, 1940:45. Use of the binomen apparently based on observed sympatry between *N. v. louisianensis* and *N. perstriatus*, the latter form being treated as a race of *N. viridescens* (given as *Triturus viridescens symmetrica*).

Triturus viridescens symmetrica: Schmidt, 1924:67. A misapplication of the name *symmetrica*. See *N. v. dorsalis* synonymy.

• DEFINITION. Aquatic adults have a total length of 65–100 mm, and a snout-vent length of 31–48 mm. Proportions are slender as compared with the nominal race; skin of the adult is smooth to finely granular. Hedonic pits are 3-3 in males, absent in females. Adults are yellow below, olive green to yellowish or olive above, with the dark dorsum clearly demarcated from the venter. Dark spots on dorsum and venter are usually quite small, and may be reduced to fine specks on the dorsal surface. Dorsal red spots are typically absent, but if present are small, faint, and incompletely ringed with black. The eft resembles that of *N. v. viridescens*, except that the dorsal red spots are greatly reduced or absent, and coloration may be dark brown rather than red above, and yellowish white rather than yellow orange below. The advanced larva is similar in color and pattern to the aquatic adult. The eft stage is common in some areas, uncommon in others. Neoteny is frequent on the southeastern coastal plain.

4. *Notophthalmus viridescens piaropicola* (Schwartz & Duellman) Peninsula newt

Diemictylus viridescens piaropicola Schwartz and Duellman, 1952:1. Type-locality, "5.2 miles east of Monroe Station, Collier County, Florida." Holotype, Univ. Michigan Mus. Zool. 106333, an adult female, collected by Albert Schwartz, L. Neil Bell, and Thomas M. Raymond, on 18 April, 1952.

Notophthalmus viridescens piaropicola: Smith, 1953:98.

Diemictylus viridescens evergladensis Peterson, 1952:103. Type-locality, "60 mi. W Miami, on U. S. Highway 94, Monroe Co., Florida." Holotype Univ. Illinois Mus. Nat. Hist. 28740, an adult male, collected by H. W. Peterson on 13 April, 1952. Neill (1954) points out that Schwartz & Duellman's paper appeared slightly in advance of that of Peterson, and *evergladensis* is, therefore, a junior synonym of *piaropicola.*

• DEFINITION. Aquatic adults have a total length of 68–100 mm, and a snout-vent length of 33–48 mm. Proportions are slender, and the skin is granular to finely spinose. Hedonic pits are 3-3 in males, absent in females. The dorsum is dark brown to almost black; dorsolateral red spots are absent or very small and faint, and are not ringed by black. The venter is heavily marked with numerous fine, diffuse dark spots on a yellow ground color clouded with sparsely distributed melanophores. Advanced larvae resemble adults but are somewhat lighter, and the dorsal dark spots are more apparent. The eft stage is rare. Neoteny is common.

COMMENT

The distributional relationships of the races of *N. viridescens* are inadequately understood. The allocation of populations as distantly removed as western Ontario and southern Georgia to *N. v. louisianensis* is unconvincing and should be reexamined. Schwartz & Duellman (1952) and Conant (1958) limit the range of *N. v. piaropicola* to southern and central Florida, but Carr & Goin (1959) include all of Florida east of Apalachicola River. A detailed study of variation over the entire range of the species is needed. Neill (1954) indicates sympatry between *N. v. viridescens* and *N. v. louisianensis* in western Florida, but confirmation is needed. The nature of the contact between *N. v. dorsalis* and *N. v. louisianensis* in South Carolina also needs study. Intergradation between *N. v. dorsalis* and *N. v. viridescens* has been well documented (Bishop, 1941b, others), but has not been recorded between *dorsalis* and *louisianensis.*

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J. S. Mecham, Texas Technological College, Lubbock, Texas 79409.

Published 20 November 1967 by the American Society of Ichthyologists and Herpetologists. Publication is supported by National Science Foundation grant 24231.

Primary editor for this account, James D. Anderson.